BACKGROUND OF THE INVENTION

The present invention relates to a drilling machine for panels made of wood, plastics materials, aluminium or the like.

The panel have a parallelepiped configuration and must be subjected to several drilling operations, to provide a plurality of spaced holes therethrough, to allow a panel to be coupled to other elements for forming a furniture piece, an equipped wall or other construction.

SUMMARY OF THE INVENTION

The aim of the present invention is to provide a drilling machine for drilling panels made of wood, plastics material, aluminium or the like, allowing the panel to be processed to be accurately and quickly located.

Within the scope of the above mentioned aim, a main object of the invention is to provide such a drilling machine for drilling panels of wood, plastics material, aluminium or the like, which can perform very accurate and quick processing operations.

Another object of the present invention is to provide such a panel drilling machine which is very reliable in operation.

According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a drilling machine for drilling panels made of wood, plastics material, aluminium or the like, comprising conveyor means for conveying a panel to be processed along a horizontal axis x, by providing intermittent displacements, so as to arrange said panel at a tool bearing rotary turret, characterized in that said drilling machine further comprises: top horizontal guiding means vertically movable along an axis y; abutment means at said horizontal guiding means and designed for translating along an axis z to fit their position to a thickness of the panel being processed; holding means applied to vertical uprights and defining a fixed supporting wall for supporting said panel being processed; and bottom guiding means adapted to translate along said axis z, independently from said horizontal guiding means, and being adjustable depending on said thickness of said panel which thickness can change with respect to other regions of said panel.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of the invention, which is illustrated, by way of an indicative, but not limitative, example, in the accompanying drawings, where:

Figure 1 is a perspective front view of the drilling machine according to the present invention;

Figure 2 is a side elevation view of the drilling machine according to the invention;

Figure 3 is an elevation front view of the drilling machine according to the invention;

Figure 4 is a top plan view of the drilling machine according to the invention;

Figure 5 is an elevation front view of conveyor means for conveying a panel to be drilled;

Figure 6 is a view similar to the preceding view, but partially broken away, illustrating the conveyor means;

Figure 7 is a partial view, on an enlarged scale, of the conveyor means;

Figure 8 is an enlarged perspective view of

the toothed pulley region of the panel conveyor means;

Figure 9 is a side elevation view illustrating two links of the conveyor belt;

and

Figure 10 is a perspective top plan view of a link of the conveyor belt.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the number references of the above mentioned figures, the drilling machine, for drilling panels in general, according to the present invention, and which has been generally indicated by the reference number 1, comprises conveyor means 2 designed for conveying a panel to be drilled 3 along a horizontal axis x, by intermittent or indexing displacements, so as to arrange said panel, in a very accurate and quick manner, at a tool bearing rotary turret 4.

Said tool bearing rotary turret 4, in particular, is mounted on a supporting element 5 which can be vertically driven along vertical guides 6, formed on an upright 7, the displacement of said supporting element 5 being controlled by a ball recirculating screw system 8, causing said turret 4 to be vertically driven.

Said turret 4 comprises a turret head thereon are arranged small heads 9 including either individual or multiple spindles or mandrels, and designed for performing the several processing operations provided for the panel 3.

The full rotation of the turret 4 can be carried out in a very quick manner; in fact, each full rotation or revolution requires 1 second and 4/10. This quick rotary movement is driven by a brushless motor and an epicycloidal reducer unit, and it is possible due to the fact that the small heads 9 are coupled to the rotary drum through ball recirculating shoes, fixed on said drum.

The guide wall axially sliding on the guide shoe is coupled to said small head.

The panel 3 is held in a vertical position and is supported by the conveyor means 2, comprising an accurately fed conveyor belt 10, and being guided at the top thereof by top horizontal guiding means 11 comprising two plurality of rollers, respectively having a vertical axis and a horizontal axis and which can be vertically driven along an axis y, being controlled by corresponding brushless motors.

In the figures are shown only the horizontal

axis rollers 20.

A first driving motor 14 controls, with a perfect parallel relationship, the vertical displacement of the rollers 12 and 20 through opposite shafts, in turn driven by a motor-reducing unit and coupled, at their two opposite end portions, to respective gears each of which meshes with a respective vertical rack 18 coupled to a respective column, pertaining to the bearing framework of the drilling machine.

Abutment rollers 13, having a vertical axis, are supported by a section member 21 which can be driven along an axis z by kinematic assemblies similar to those which are hereinabove disclosed, so as to fit the positions of the abutment rollers 13, to the thickness of the panel 3 being processed.

To that end, moreover, a horizontal cross member 24 is provided at the bottom of the construction, which cross member supports a plurality of guide rollers 25 which can be adjusted, depending on the thickness of the panel 3, which thickness can change through the several regions of said panel.

The assembly, formed by two horizontal arms 26 supporting the roller 20 bearing section member 21,

is in turn supported by two rodless cylinders, held in the columns 19, and which are pneumatically supplied so as to compensate for the weight of the assembly, thereby allowing said assembly to be vertically driven with a high driving speed, up to 60 m per minute, in this embodiment.

That same pneumatic system for compensating for the assembly weight, is also used for the supporting element 5 of the turret 4, which turret can be accordingly vertically driven with a comparatively high driving speed.

The conveyor means, generally indicated by the reference number 2, comprise a conveyor belt 10, including a plurality of conveyor belt links 103 which can slide on guiding means comprising a frame 104 and being driven by a toothed or cogged belt 105, also supported on the supporting frame 104.

Each said link 103 is coupled to adjoining links, by pivot pins 109 and rolling bushings 110.

Each said link 103 is provided, at the bottom thereof, with a plurality of teeth 111 having a configuration and a depth size corresponding to the configuration and size of the teeth 112 of the toothed or cogged belt 105, thereby providing engagement means

for engaging the teeth 112 of the toothed belt.

The toothed belt 105 has its tooth arrangement 112 outward facing and extends with a specifically designed path, as it can be clearly shown in figures 6-8.

More specifically, the toothed belt 105 slides on the supporting frame 104, by defining at least a top flat trajectory or path, as guided by guiding rollers 113, and being then directed through a return path by two end pulleys 114 and 115, arranged at the ends of the trajectory.

At an intermediate region of the top flat trajectory or path, is provided a cogged pulley 116, arranged, at the bottom, between a pair of flat pulleys 117 and 118 which, by cooperating with the cogged pulley 116, cause the toothed or cogged belt 105 to define a downward directed belt loop.

The cogged or toothed pulley 116 is driven by a driving means (not shown) including, depending on requirements, a step by step motor, a DC motor, or a brushless motor, through a suitable motor reducing unit.

The number of the links 103 forming the conveyor belt 10 can be changed depending on the

desired length of the conveyor belt, which slides along a substantially oval guide arranged at the periphery of the supporting frame 104.

Said guide comprises two top 121 and bottom 122 rectilinear guide portions, coupled by two semicircular guide portions 123 and 124.

Said guide forms a rail arrangement adapted to engage the guide bearings of the conveyor belt links 103, so as to allow the engagement means comprising the teeth 111 and links 103 to engage the teeth 112 of the belt 105 at least along the top rectilinear portion thereof.

Thus, the belt 105 will drive the conveyor belt 10 the links 103 of which are provided with supporting elements 125 for supporting the panel 3.

The drilling machine 1 according to the invention comprises moreover an auxiliary head 30, for one or more tools, so assembled as to be vertically driven along the axis y and horizontally driven along the axis x.

Said auxiliary head 30 is, to that end, supported by a supporting element 31 which can be driven along a ball recirculating screw element 32, vertically extending, and coupled to a second

supporting element 33 in turn movable along a ball recirculating screw 34, which horizontally extends.

Accordingly, the auxiliary head 30 can be driven along the horizontal axis x and vertical axis y, as well as crossway the axis x, to allow the operating tool to affect the panel 3 being processed, while it is driven along the conveyor 10.

In other words, the head 30 can process the panel while being driven therewith, and, at the end of the processing operations, it can be brought again to its starting position to operate upon or process a following panel.

It has been found that the invention fully achieves the intended aim and objects.

In fact, the panel drilling machine according to the present invention can operate with a very high vertical and horizontal speed for clamping the panel and, accordingly, can perform very accurate processing operation, at a very high processing speed.

A further advantage of the drilling machine according to the present invention is that it allows its clamping elements to be driven with a high speed both vertically and horizontally.

Yet another advantage of the panel driving

machine according to the present invention is that said machine comprises adjusting systems for adjusting, in a differentiated manner, the thickness of the panel, which adjusting systems allow said panel to be located in a very accurate and quick manner even if said panel comprises different thickness panel regions.

Yet another important advantage of the drilling machine according to the present invention is that it comprises a specifically designed operating system for turning the processing head and latching or engaging it with the central spindle.

In practicing the invention the used materials, as well as the contingent shapes and size can be any, depending on requirements and th status of the art.